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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/620,453	07/17/2003	Saeed Gazor	9-13528-192US	9182

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EXAMINER	
HAN, QI	
ART UNIT	PAPER NUMBER
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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/620,453	GAZOR ET AL.	
	Examiner	Art Unit	
	Qi Han	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/17/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The references listed in the Information Disclosure Statement submitted on 07/17/2003 have been considered by the examiner (see attached PTO-1449).

Specification

2. The disclosure is objected to because of the following informalities:

a. On page 21, paragraph 55, the variables used for the mapping are not consistent without any explanation. For example, in one piece, it uses v_i, σ_i and α_i and the other two pieces it uses v, σ and α. Further, the recited "piece-wise **linear** function" appears to be incorrect because the function has a variable σ with square operation, which is non-linear. Appropriate correction and/or clarification are required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding claim 1, it claims "a method" in preamble, which appears, in the surface, to fall within statutory classes (i.e. a process). However, based on the claimed language, the terms "signal", "parameters" and "components" can be interpreted as pure data in a broad sense, and

the claim, as whole, is substantially drawn to or reasonably interpreted as manipulating pure (abstract) data or algorithm, which falls within 35 USC 101 Judicial Exceptions, i.e. abstract idea. Further, since the claim, as whole, only involves or manipulates pure (abstract) data or algorithm and the results is in abstract nature, it lacks to produce a useful, tangible, **and** concrete result in a **practical application**. Therefore, the claim, as whole, is directed to non-statutory subject matter.

Regarding claims 2-23, the rejection is based on the same reason described for claim 1, because these dependent claims include the same or similar problematic limitations as claim 1.

4. To expedite a complete examination of the instant application the claims rejection under 35 U.S.C 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 10 and 22-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 10, the limitation "using a value computed when the components of a previous frame were processed to determine which of the parameters characterizing the respective distribution to update" is confused or unclear. The limitation appears to say using a

value based on **previous** processed frame to determine the **current** frame parameters for updating, which does not make sense to the examiner, since the distribution of current frame may not be the same type as that of previous frame. Therefore, the limitation is indefinite.

Regarding claim 22, it recites the limitation "computing at least an approximation to an expected value of the composite Gaussian and signal distribution using **the value of the component**, and the parameters, to obtain a signal-enhanced component..." There is insufficient antecedent basis for this limitation in the claim.

Regarding claim 23, the rejection is based on the same reason described for claim 22, because the dependent claim includes the same or similar problematic limitation(s) as claim 22. In addition, the limitation "piece-wise **linear** function approximation of the expected value" is also indefinite because the related disclosure shows the function is non-linear (see closest disclosure in p55 of the specification, wherein the function includes a variable σ with square operation --non-linear function), which conflicts with the claimed limitation. Appropriate correction and/or clarification is required.

Regarding claim 24, it recites the limitation "**the value of the component** to obtain ..." There is insufficient antecedent basis for this limitation in the claim.

Regarding claims 25-26, the rejection is based on the same reason described for claim 24, because the dependent claims include the same or similar problematic limitation(s) as claim 24.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 6, 10-11, 16,-18, 22, and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over ERTEN (US 2002/0116187 A1).

As per **claim 1**, as best understood in view of the rejection under 35 USC 101 (see above), ERTEN discloses 'speech detection' (title), comprising:

"decomposing a frame of the noise-contaminated signal received in a predefined time period into decorrelated signal components" (Fig.8, and paragraph (hereinafter referenced as p)106, 'time window (predefined time period)'; p107, 'frequency converter 158 generates (decomposes) speech frequency bands ...from windowed speech signal (frame)152', 'implement a fast Fourier transform (FFT) algorithm', wherein Fourier transform inherently decomposes the windowed signal (frame) into uncorrelated signal components; Fig. 5, shows separation of speech 60 and noise 30, which can also be read on the claim);

"recursively updating respective parameters characterizing a Gaussian noise distribution and a signal distribution of each of the respective components as a function of time", (p42, 'parameter matrices' and 'continuous-time dynamics or discrete-time state' (function of time); p49, 'mixing environment can be modeled as the following nonlinear discrete-time dynamic processing model (function of time)'; p53, 'the update law for dynamic environments (corresponding to recursively updating) is used to recover the original signals' and

'environment 42 is modeled as linear dynamical system'; p110, 'voice signals tend to have Laplacian probability distribution' and 'noise signals...tend to have a Gaussian or Super-Gaussian probability distribution'; p103, 'properties (also corresponding to parameters) can convey any information' including 'power, statistical properties, spectral properties, envelop properties, proximity...);

"using the respective parameters to evaluate a [composite Gaussian and signal] distribution function to provide a measure of noise and signal contributions to the component" (p110, 'the variance (measure)...may be used to determine (evaluate) the presence of voice (corresponding to signal contributions)' and 'various other statistical measures, such as kurtosis, standard deviation ...may be extracted as properties of speech and noise signals or frequency bands (components)'; Figs. 2-5, 'mixed environment' (corresponding to a distribution function)).

But, ERTEN does not expressly disclose the distribution function being "**composite Gaussian and signal** distribution function". However, as stated above, ERTEN teaches that 'voice signals tend to have Laplacian probability distribution' and 'noise signals...tend to have a Gaussian or Super-Gaussian probability distribution' (p110), and processing the mixed signal in 'mixed environment' (Figs. 2-5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that the mixed signal would have a mixed (joint or composite) distribution that corresponds to the mixed environment, and to combine the teachings of ERTEN by providing a mixed (joint or composite) distribution that reflects the mixed signals with properties of Laplacian probability distribution (for speech) and Gaussian probability distribution (for noise) in the mixed environment, because either of speech and noise has its own probability distribution as suggested by ERTEN and the mixed signal is

necessarily associated with a mixed (joint or composite) distribution to reflect properties of the mixed signal and noise distribution in the mixed environment.

As per **claim 2** (depending on claim 1), the rejection is based on the same reason described for claim 1, because the rejection for claim 1 covers the same or similar limitation(s) as claim 2.

As per **claim 3** (depending on claim 1), the rejection is based on the same reason described for claim 1, because the rejection for claim 1 covers the same or similar limitation(s) as claim 3, wherein 'time window' and 'windowed speech signals' inherently include the claimed "a predefined number of samples" and FFT also inherently includes the claimed "applying a matrix transform".

As per **claim 4** (depending on claim 1), the rejection is based on the same reason described for claim 1, because the rejection for claim 1 covers the same or similar limitation(s) as claim 4, wherein 'FFT' inherently includes the claimed "mapping...from a time domain to a frequency domain".

As per **claim 6** (depending on claim 1), the rejection is based on the same reason described for claim 1, because the rejection for claim 1 covers the same or similar limitation(s) as claim 3, wherein 'Fourier transform' inherently includes the sinusoidal functions as basis functions as claimed.

As per **claim 10** (depending on claim 2), as best understood in view of the rejection under 35 USC 112 2nd (see above), ERTEN discloses "a value computed when the components of a previous frame were processed to determine which of the parameters characterizing the respective distribution to update" (Fig. 7 and p104-105, 'detection parameter...may be

scaled...or ...a binary value', which is used to 'attenuates (update) extracted speech signal'; also see Fig. 8 and p108).

As per **claim 11** (depending on claim 10), ERTEN does not expressly disclose "wherein the previously computed value is an a priori probability of the frame constituting noise, and using the a priori probability to determine which of the parameters to update comprises: selecting a measure of variance that characterizes the Gaussian noise distribution if the a priori probability is below a predetermined threshold; and otherwise selecting a measure of variance factor that characterizes the Laplacian distribution." However, ERTEN teaches that using 'probability density of the Jth component (interpreted as a priori probability of components, including noise)' (p47); 'speech likelihood signal may be a binary signal or may expressed some probability that speech has been detected' (p114); 'a binary value resulting from comparing the operation results to one or more threshold values' (p104); 'voice signals tend to have Laplacian probability distribution...noise signals...tend to have a Gaussian or Super-Gaussian probability distribution...thus voice signals can be said to be of low variance', 'the variance of extracted speech signal or speech frequency bands may be used to determine the presence of voice' and 'various other statistical measures...my be extracted as properties of speech and noise signal or frequency bands' (p110). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that the likelihood signal expressed by probability can be an a priori probability and is associated with Laplacian (for speech) and/or Gaussian (for noise) probability distribution using the corresponding variance, and to combine the teachings of ERTEN by providing (a priori) probability and the associated Laplacian (for speech) or Gaussian (for noise) probability distributions using variance, as suggested by ERTEN,

for the purpose (motivation) of using various statistical measures for extracting properties of speech and noise and/or produce separated speech and noise signals from mixed a signal (ERTEN: p110 and p39).

As per **claim 16** (depending on claim 11), as state above, ERTEN discloses "computing a measure of fit of the components to a composite Gaussian and Laplacian distribution" (as describe for claim 1; also see ERTEN: p103 and p110).

As per **claim 17** (depending on claim 16), ERTEN further discloses "computing a measure of fit of each of the received components to a respective Gaussian noise distribution defined using the respective parameters; and comparing a mean of the measures of fit to the respective Gaussian noise distributions with a mean of the measures of fit to the composite Gaussian and Laplacian distributions, to compute a likelihood that the components of the frame constitute noise or noise-contaminated voice signal", (ERTEN: 103, 'properties (measures or parameters)... may include...statistical properties (necessarily including mean value), ...averages (broadly interpreted as mean values)...model fitting values (including measure of fit)'; p110, 'various other statistical measures'; Fig 5 and p90, 'generates (comparing result)...the difference between sound signal (corresponding to the composite Gaussian and Laplacian distributions) from microphone m2 and filtered noise signal (corresponding to Gaussian noise distributions)'; p113-p114, 'speech detected signal has such noise periods attenuated' (detecting noise) and 'speech likelihood signal may be a binary signal (implying either speech with noise or background noise only); which corresponds to the claim).

As per **claim 18** (depending on claim 17), ERTEN discloses "evaluating the distribution at the value of the component received" (with same reason described above; also see ERTEN: p110).

As per **claim 22** (depending on claim 1), as best understood in view of the rejection under 35 USC 112 2nd (see above), ERTEN does not expressly disclose "computing at least an approximation to an expected value of the composite Gaussian and signal distribution using the value of the component, and the parameters, to obtain a signal-enhanced component, if it is determined that the frame is signal active". However, ERTEN teaches generating 'one or more noise signal properties' including 'statistical properties...average (approximation to an expected value)...model fit values (can also includes approximation to an expected value)' (p103), using 'Gaussian' and 'Laplacian probability distributions' with 'various statistical measures (including approximation to an expected value, such as the corresponding estimated sample value)' to 'determine the presence of voice' (p110); 'speech likelihood signal' and 'speech detector' (p114); and extracting 'noise signal' and producing 'detected speech signal (obtain a signal-enhanced component' (Fig. 5 and p90; and Fig. 7 and 105). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that a temporal (or ergodic) value of a test samples can be used as an approximation of statistical expected (ensemble) value, such as a time average can be an approximation of a mean (statistical expected) value, and to combine the different teachings of ERTEN by providing an approximation to an expected value with Laplacian and Gaussian (for noise) probability distributions, such as time average, suggested by ERTEN, for the purpose (motivation) of

extracting properties of speech and noise and/or producing separated speech and noise signals from mixed a signal (ERTEN: p110 and p39).

As per **claim 24**, it recites an apparatus. As best understood in view of the rejection under 35 USC 112 2nd (see above), the rejection is based on the same reason described for claims 1 and 22, because the rejection for claims 1 and 22 covers the same or similar limitation(s) as claim 24 (wherein 'speech likelihood signal' and 'speech detector' (p114) is read on "voice activity detector" with the associated functionality as claimed), accept the limitation "an inverse signal transform for re-composing the frame of samples". However, this feature is further disclosed by ERTEN (p40, 'transform function inversion'; Fig. 8 and p109, 'combiner 170 performs...by an inverse-FFT to generate detected speech signal 34').

As per **claim 25** (depending on claim 24), ERTEN discloses "the clean speech estimator computes an expected value of each of the composite Gaussian and Laplacian distributions to independently derive a speech-enhanced component corresponding to each of the components" (p110, 'the variance (expected value) of extracted speech signal 28 or speech frequency bands (components) may be used to determine (evaluate) the presence of voice (corresponding to signal contributions)' and 'various other statistical measures, such as kurtosis, standard deviation (also expected values) ...may be extracted as properties of speech and noise signals or frequency bands (components)'; Fig. 8 and p108-p109, 'any property of speech frequency band o noise frequency band may be used' including 'statistical properties'; 'combiner 170 combines frequency band output (a speech-enhanced component) 168 for each speech frequency band 160 to generate detected speech signal').

7. Claims 5, 7-9 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over ERTEN in view of admitted prior art disclosure, hereinafter referenced as ADMISSION.

As per **claim 5** (depending on claim 4), ERTEN does not expressly disclose "mapping the frame comprises applying a **discrete cosine transform** to the frame of samples". However, the feature is well known in the art as evidenced by ADMISSION who teaches that 'there are many known transforms for decomposing (mapping) a frame of samples' and 'the most common of these include the frequency-domain transforms such as the Fourier transform, and the discrete cosine transform (DCT), wavelet decomposition transforms such as the standard wavelet transform (SWT), and adaptive transforms like the Karhunen-Loeve Transform' (p5-p6 in the section of "Background of the Invention" of the specification). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify ERTEN by providing a transform using DCT for the decomposition, as taught by ADMISSION, for the purpose (motivation) of providing low complexity decomposition technique (ADMISSION: p6).

As per **claim 7** (depending on claim 6), ERTEN does not expressly disclose decomposing the frame into "wavelets". However, the feature is well known in the art as evidenced by ADMISSION who teaches that 'there are many known transforms for decomposing (mapping) a frame of samples' and 'the most common of these include the frequency-domain transforms such as the Fourier transform, and the discrete cosine transform (DCT), wavelet decomposition transforms such as the standard wavelet transform (SWT), and adaptive transforms like the Karhunen-Loeve Transform' (see p5 and p7 in the section of "Background of the Invention" of the specification). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify ERTEN by providing a transform using DCT for the

decomposition, as taught by ADMISSION, for the purpose (motivation) of better representing discontinuities for the signal (ADMISSION: p7).

As per **claims 8-9** (depending on claim 6), ERTEN does not expressly disclose "recomputing the basis functions to adaptively optimize decomposition" and "applying an adaptive Karhunen-Loeve transform". However, the feature is well known in the art as evidenced by ADMISSION who teaches that 'there are many known transforms for decomposing (mapping) a frame of samples' and 'the most common of these include the frequency-domain transforms such as the Fourier transform, and the discrete cosine transform (DCT), wavelet decomposition transforms such as the standard wavelet transform (SWT), and adaptive transforms like the Karhunen-Loeve Transform' (p5 and p7 in the section of "Background of the Invention" of the specification). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify ERTEN by providing a transform using DCT for the decomposition, as taught by ADMISSION, for the purpose (motivation) of maximizing the capacity of the basis functions to present the signal (ADMISSION: p7).

As per **claim 26** (depending on claim 25), the rejection is based on the same reason described for claim 5, because the claim recites the same or similar limitation(s) as claim 5.

8. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over ERTEN in view of VALVE et al. (US 6,707,910 b1), hereinafter referenced as VALVE.

As per **claim 12** (depending on claim 11), ERTEN does not expressly disclose "the a priori probability is defined by evaluating a hidden state of a hidden Markov model". However, the feature is well known in the art as evidenced by VALVE who discloses 'detection of the

speech activity of a source'(title), comprising using 'HMMs (hidden Markov models—statistical models)' having 'probability density function (pdf: corresponding to a priori probability)' for 'speech activity detection' (col. 9, lines 22-49). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify ERTEN by providing HMMs with pdfs for speech activity detection, as taught by VALVE, for the purpose (motivation) of improving speech activity detection by utilizing statistical information (VALVE: col. 9, lines 9-13).

As per **claim 13** (depending on claim 12), ERTEN in view of VALVE discloses "incrementally changing the parameter in accordance with a difference between an expected value of the component given the past value of the parameter, and the value of the component received" (ERTEN: p53, 'the update law for (dynamic incrementally changing) environments is used to recover the original signals' and 'environment 42 is modeled as linear dynamical system'; p110, 'statistical measures (parameters)', such as 'variance', 'kurtosis' and 'standard' can be interpreted as expected value; wherein HMMs inherently include determining difference(s) (state changing) between current parameter(s) and the past value of the parameter(s), as claimed).

Conclusion

9. Please address mail to be delivered by the United States Postal Service (USPS) as follows:

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Qi Han whose telephone numbers is (571) 272-7604. The examiner can normally be reached on Monday through Thursday from 9:00 a.m. to 7:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil, can be reached on (571) 272-7602.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Inquiries regarding the status of submissions relating to an application or questions on the Private PAIR system should be directed to the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 703-305-3028 between the hours of 6 a.m. and midnight Monday through Friday EST, or by e-mail at: ebc@uspto.gov. For general information about the PAIR system, see http://pair-direct.uspto.gov.

QH/qh
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